GEER-TIONA LOT 202 LEASE
Allegheny National Forest
Oil Heritage ~~Recording Project~~
Tiona Field
Tiona Vicinity
Warren County
Pennsylvania

HAER No. PA-441

HAER
PA
62-TIO.V
1-

PHOTOGRAPHS

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
Department of the Interior
1849 C Street, NW
Washington, DC 20240

ADDENDUM TO:
GEER-TIONA LOT 202 LEASE
Tiona Field
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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
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ADDENDUM TO
GEER-TIONA LOT 202 LEASE

HAER No. PA-441

LOCATION: Tiona Field, Tiona vicinity, Warren County, Pennsylvania
UTM: 17.659902.4622621

DATE OF CONSTRUCTION: ca. 1890

PRESENT OWNER: Allegheny National Forest

PRESENT USE: Abandoned

SIGNIFICANCE: Pennsylvania is the birthplace of the petroleum industry, signified by the drilling of Edwin Drake's well near Titusville in 1859. Many widely used techniques of drilling and pumping oil were first developed here in the effort to recover the high-quality "Pennsylvania Grade" oil. One particularly important and successful technique perfected in Pennsylvania was "central power" pumping of numerous low-production wells to economically recover small amounts of oil. This method of production flourished between ca. 1890 and ca. 1950, and today there are only scattered remains of the once common pumping technique. The Geer-Tiona Lot 202 Lease is an excellent example of an early wooden "hillside" bandwheel central power.

HISTORIAN: Michael Caplinger, 1997

PROJECT INFORMATION: The Allegheny National Forest Oil Heritage Recording Project was undertaken during the summer of 1997 by the Historic American Engineering Record (HAER, Eric DeLony, Chief), a long-range program to document historically significant engineering, industrial and maritime works in the United States. The program is part of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Division of the National Park Service, U.S. Department of the Interior. This project was sponsored by cooperative agreements between HABS/HAER, E. Blaine Cliver, Chief; the West Virginia University Institute for the History of Technology and Industrial Archaeology (IHTIA), Dr. Emory Kemp, Director; and Allegheny National Forest (ANF), a unit of the Eastern Region of the U.S. Department of Agriculture (USDA) Forest Service, John Palmer, Supervisor. The Southwestern

Pennsylvania Heritage Preservation Commission, Randy Cooley, Director, provided major funding.

The field work, measured drawings, historical reports and photographs were prepared under the general direction of Christopher Marston, HAER Project Leader, with consultation from Phil Ross, ANF Historian. The field team was led by Eric Elmer, HAER Field Architect Supervisor and Michael Caplinger, IHTIA Historian. The team included Arturs Lapins, US/ICOMOS Intern (Latvia); and IHITA delineators Paul Boxley, Scott Daley, Kara Hurst, and Kevin McClung. John T. Nicely produced the large format photography.

See also HAER No. PA-436, "Allegheny National Forest Oil Heritage," for a broad overview of the history of oil production in Pennsylvania and the history and operations of central power well-pumping systems.

INTRODUCTION

While petroleum sometimes would flow from a well under its own pressure, this was not usually the case. Most successful oil wells in Appalachia followed a pattern of high initial production (sometimes hundreds of barrels per day per well) followed by a rapid drop off to a few barrels per day--or week--or nothing at all. Thereafter, the well had to be mechanically pumped to recover any oil. By the 1870s, the "standard" pumping outfit was in use in Pennsylvania. Much of the surface equipment used to drill a well (the engine, bandwheel, and walking beam) could also be used to pump it. This was a one-engine-one-well system in which a steam-powered engine pumped a single well, termed "pumping on the beam."

After a well aged and production leveled off, it required pumping for only a short period, perhaps once or a few times a week.[1] In the decade following the establishment of Drake's well, there was little impetus for pumping low-production wells after their initial outflow, since new fields were continually being discovered and the drillers could simply move on to sink another well. There were exceptions, however, such as when the oil tapped by a well was of extremely high quality. With oil prices extremely low, though, it cost too much to outfit, maintain and equip an installation at each well. As prices began to stabilize in the 1880s, pumping became more feasible, and economization of the process became the key to profitability. This drive for efficiency resulted in the popularization of centrally powered multiple-well pumping systems, which were perfected in Pennsylvania's oil fields.

The essential components of a central power system were: the prime mover, or engine; a power reduction/motion-conversion/power distribution unit (always called the "power" in oil-field parlance, not to be confused with the engine or prime mover), which converted the engine's rotary motion to horizontal reciprocating motion; the shackle lines (also called pull, jerker or rod lines), which transmitted the reciprocating motion from the power out to the pump jacks; the pump jacks, which converted the horizontal reciprocating motion of the rod lines to vertical reciprocating motion; and finally, the sucker rods, which operated valves at the bottom of the well that pumped the oil to the surface. The engine and power required a substantial concrete foundation to resist the immense strains put on the machinery, and both were enclosed in a protective powerhouse. Powerhouses not only lessened the chance for fires, but also held spare parts and tools and gave the pumper and machinery protection from the elements. These equipment configurations were generally called central powers, but the term "jack plant" was also common. With the advent of gas and oil powered engines in the mid 1890s, costs were further lowered since the engine was powered by gas produced from the very wells it was pumping--a sort of low-cost perpetual pumping machine that required little manpower or maintenance to keep in operation. By about 1900, numerous oil-well supply companies had developed standardized systems that could be purchased in part or whole.

Certain factors controlled the use of central powers. Wells had to be relatively shallow, less than 3,000'. While up to forty shallow wells could theoretically be pumped by a well-balanced high-powered system, fifteen to twenty was a more common number. The wells had to be in relatively close proximity, within a mile. Although the shackle lines could be routed over and

[1] To increase production, a well could be "shot" or "torpedoed" with nitroglycerin to extensively fracture the oil sands at the bottom of the hole.

around difficult terrain, extreme topography could hinder their use and was sometimes better suite to individual wells pumping "on the beam." While central power systems flourished between ca. 1880 and ca. 1950, the "unit pumper," a self-contained pumping machine powered by a small gasoline engine or electric motor, succeeded them.

GEOLOGY

Geer-Tiona Lot 202 Lease is located in the Clarendon field and taps the main Clarendon pool, which was first discovered at the Tolles #1 well near Clarendon in Lot 55 on January 13, 1878. The pool produces from the Clarendon Stray sand (located just above and nearly identical to the Clarendon sand) and the Clarendon sand, which is the main producer. Drillers also call the Clarendon sand "Tiona" or "Third" sand.[2] At this site, the Clarendon sand is probably found at a depth between 900' and 1,500' and ranges in thickness from 20' to 40'. This installation was constructed around 1890 and operated until around 1965, intermittently pumping at least eleven wells.

South of Stoneham, many wells have undergone intensive water-flooding operations since the 1940s. Air and gas repressurization (called secondary recovery) have been used in the Clarendon Pool. Lou Geer introduced hydraulic fracturing, an alternative method to "torpedoing" a well with nitroglycerin to the area in 1962. Geer currently operates the leases on this lot. He was the last to operate the plant and still runs other wells on the wells on the lease as of the writing of this report.

MACHINERY AND THE POWERHOUSE

This is an example of an early (ca. 1890), low-cost pumping plant. Most of the pumping engine is missing (although a portion of the broken flywheel remains), thus a typical ca. 1900 engine was substituted on the measured drawings done by HAER of this site. This may have been a steam engine at one time that was later converted to gas supplied by a nearby well-head. A thermal siphon system circulating water from the wooden coolant-water reservoir beside the building cooled the engine. An adjustable, hand-built belt tensioner, or idler, is located midway between the engine and bandwheel, but the drive belt is missing.

Originally, steam powered this operation's prime mover, although it was later converted to a "half-breed" by the addition of a gas cylinder. The engine experienced problems around 1950 and was largely removed. Part of the base remains, but the rest was cut out with a torch. A small, timber foundation was constructed flush with the old engine to support an electric motor, which was hooked up to the power transmission belt. The electric motor was removed after the operation's closure around 1965.

The wooden bandwheel was probably fabricated onsite with ironwork purchased from local manufacturers. The bandwheel, with two steel overslung eccentrics, powered at least eleven wells. This is a tilted "hillside" power, and the strains acting on the bandwheel required a heavy

[2] William Lytle, *Oil and Gas Geology of the Warren Quadrangle, Pennsylvania* (Harrisburg: Commonwealth of Pennsylvania, 1965), 37.

hewn-timber crossbeam over the center of the bandwheel, as well as a concrete base, to hold it firmly in place. The timber is mounted on concrete buttresses on either side of the power room. Eleven 1"-diameter steel rod lines attach to the eccentrics, and the rod lines are supported on a number of friction post supports, swing posts, and tripod pendulum swings. The pump jacks are W.C. Norris Company (of nearby Tiona) direct-acting underpull jacks.

The powerhouse is an elongated, wood-frame structure with vertical wooden siding and a corrugated metal-sheet roof (probably a replacement for an earlier asphalt or wood-shingle roof). The space for the power is slightly wider than the rest of the building, and its west wall and roofline extend somewhat from the structure. One door in the building's north end allows access, and one small window in the east wall provides light. The interior is crude, undivided and has sloping dirt floors. There is no interior tin-sheeting on the walls, and the wood framing is exposed. Construction materials for the buildings were no doubt obtained locally, and the lease operator probably built the powerhouse. The machinery was put in place first, and the building erected around it.

One or two men who started the engine and pumped the wells two or three times a week probably maintained and operated this jack plant. A single pumping cycle usually lasted less than two hours. Each well likely produced less than three barrels of oil a week.

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